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"Assessment of the Effectiveness of Dialogue
Among Researchers, Managers, and the Public for
Developing Alternatives for Action in Response..
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Assessment of the Effectiveness of Dialogue Among Researchers, Managers, and the Public for Developing Alternatives for Action in Response to Altered Bitterroot Ecosystems

Prepared for
Bitterroot Ecosystem Management Research Project

Technical Completion Report

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By

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INTRODUCTION

As greater amounts of information generated by scientific research are brought forward in the natural resources management sector, the means by which this information can be best communicated among stakeholders and applied to natural resources problems remains an ongoing concern among citizens, managers, and scientists. Information that is generated by science must meet rigorous protocols in its development, assembly, and evaluation, and thus, sustains a high level of credibility among both resource professionals and the public (Jasanoff 1990). However, this same information does not typically find itself at the forefront of many decisions, as other public values, political demands, or institutional constraints emerge as dominant influences. Accepting that these other factors are legitimate considerations in allocating public resources, it is important to gain a fuller understanding of how new forms of communication may be effective in transferring scientific information and stimulating ideas that can guide forest management. This study is an attempt to explore how one potential communication method - focused dialogue among existing, volunteer interest groups - can affect people's preferences for management action on altered ecosystems in the Bitterroot Valley.

The study is part of a larger research effort to examine the interaction of science and management in the Bitterroot ecosystem. The Bitterroot Ecosystem Management Research Project (BEMRP) was developed in the early 1990's to provide a better understanding of the function of ecological systems and their interactions with human communities in the Bitterroot River watershed in western Montana. BEMRP is a three way cooperative project among the Bitterroot National Forest, the Rocky Mountain Research Station, and the University of Montana, conducting cross-disciplinary research in four major focus areas: vegetation, fauna, landscape analysis, and human dimensions. This research falls within the human dimensions area, which has sponsored a broad portfolio of research projects on the social context for ecosystem management and methods for public participation associated with the management of the Bitterroot National Forest (McCool and others 1999).

The nature of this research is exploratory, in that it will attempt to provide insight into several areas of investigation simultaneously, allowing future studies to provide in-depth explanations of relationships. Not only does this study intend to examine the efficacy of an alternative communication method among scientists, managers, and citizens, but it wishes to explicate specific recommendations among divergent groups on potential on-the-ground actions to restore altered ecosystem conditions. These recommendations are somewhat limited, since the scope of the research is narrowly focused. It concentrates its inquiry on only two small, voluntary associations in the Bitterroot Valley, plus the line officers of the Bitterroot National Forest. The number of respondents to research questions is too small to allow quantitative statistical analyses, and the lack of a representative sample of Bitterroot residents constrains results from being generalized to the broader population of citizens in the Bitterroot Valley. However, the qualitative analysis conducted within this research illuminates major domains of interest among important actors in forest management decisions in the Bitterroot, revealing several of the

challenges ahead for concerned parties to reconcile competing goals for the management of natural resources. Information from this study may be helpful to future participants within BEMRP operations, allowing them to consider additional means by which research efforts may be organized, communicated, and evaluated.

BACKGROUND

Located in a highly scenic and ecologically diverse setting in western Montana, the Bitterroot Valley has been a focal point for major forest management controversies over the last four decades. From the report of Arnold Bolle (Senate 1970) that criticized the multiple use practices of the Forest Service, to the current struggle over the reintroduction of grizzly bears in the Selway-Bitterroot Wilderness Area, people have engaged in fierce debates over appropriate management actions on the Bitterroot National Forest. The Bitterroot Valley will likely continue as a locus for natural resource controversies, since the combination of high mountains and a broad, open valley offers multiple opportunities for recreation, residential, and economic developments. Of great importance is the attractiveness of the valley for human settlement. The opportunity to experience a rural lifestyle while maintaining convenient access to urban services in the towns of Hamilton and Missoula is highly appealing to a mobile and aging population. Especially since 1990, the valley has experienced a steady flow of in-migrants (McCool and Hayes 1996). Many of these new residents arrive from urban areas outside of Montana (Von Reichert, personal communication), and they frequently embrace expectations for land use that conflict with traditional, localized norms for natural resources management.

Science-based information plays a significant role in characterizing resource conditions and estimating the effects of management activity. As our knowledge increases about ecological processes and the patterns of change across large landscapes, our recognition grows that ecosystems are complex, dynamic, and subject to uncertain, stochastic disturbances (Haney and Boyce 1997). For example, research may demonstrate that certain types of vegetative patterns will be a common outcome of successional pathways, but a new disturbance element, such as an exotic plant species, may fundamentally and unexpectedly interrupt these pathways. Thus, even though scientific information is expected to help clarify cause-effect relationships to substantiate the anticipated outcomes of management prescriptions, researchers are increasingly aware of the inherent weaknesses of their predictive powers in natural resources applications (Jasanoff 1990, Lele and Noorgard 1993, Albaek 1995). Science remains a process of estimation, experimentation, and revision, such that we are only capable of providing provisional, partial answers to questions about relationships in highly complex systems.

Compounding the problem in accurately portraying resource conditions is the limited capacity of researchers to devote their energies to communicating their findings to a broader audience. Because of the demands on the time and expertise of research staff of modern organizations, there is frequently little time available for communication efforts, especially on problems or issues that cross disciplinary lines (Cortner et al. 1996). Communications that do occur are typically quite stylized (publications in journals,

papers in conferences, and other forms of technical writing), and they are not highly accessible to citizens and mangers. There is little internal incentive (promotions, recognition) for translating technical material into material for broad consumption.

Nevertheless, communication efforts must move forward for research to have value. Non-traditional methods are being attempted by many research institutions to move research more quickly into mainstream applications among resource professionals (Cortner et al. 1996). The BEMRP project itself has attempted a "science-management partnership" that experiments with new forms of communication, such as annual, public events to display research information and open-houses in the Bitterroot Valley to attract interested citizens to interact with researchers. The underlying significance of the research sponsored by BEMRP is to bring new understanding and innovative management tools into application into the northern Rocky Mountain region.

Since this study explores how science information can lead to the identification of opportunities for on-the-ground actions, methods of communication are particularly important. As BEMRP science uncovers new relationships and patterns on the landscape, the salient elements of communication theory for BEMRP's purposes revolve around the diffusion of innovations. As Everett Rogers (1983) points out in his text on the subject: "*Diffusion* is the process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas. *Communication* is a process in which participants create and share information with one another in order to reach a mutual understanding" (p. 5, emphasis original). Communication success within the diffusion of innovations model depends on several factors (Muth and Hendee 1980): (1) The relative advantage of the innovation; (2) Its compatibility with the values of the adopters; (3) The ease by which the innovation can be understood and applied [complexity]; (4) The trialability of the new practice; and (5) The ease in which the innovation and its effects can be observed. Even though many of the research projects within BEMRP were not designed to generate revelations that could be immediately persuasive to actions, a large number of studies were carried out to inform potential management applications. It is logical to assume that attempts to communicate these findings within the existing social systems in the Bitterroot Valley could stimulate affirmations of support or other creative suggestions for the adoption of projects that apply these same research findings.

The ability of scientific information to stimulate innovative ideas about on-the-ground actions presents some obvious challenges. For example, experiments that have been conducted by scientists are frequently invisible to observation, and thus, difficult to be supported. Friemund's study (1998) of computer-based communication of information in the Stevensville West-Central process highlighted the problems of diffusing scientific information that is based on high-tech, computer platforms. He concluded that the complexity of the models and their limited trialability reduced their communication effectiveness. In addition, scientific information is rarely presented as a text for lay readers. It is intended for specialists to build the breadth and depth of human knowledge on specific phenomena, and requires a certain amount of translation to be accessible to

the unfamiliar. Finally, since science information is predominantly distributed via the printed page (or now, downloadable computer file), it remains sterile and somewhat aloof from its audience.

Personal contacts are vital for an effective and lasting transfer of ideas, especially when addressing deeply contextual and dynamic situations such as those surrounding natural resources problems (Rothman 1974, Shannon 1991). Peer networks are the most useful means to communicate new information (Rogers 1983), and forms of direct, face-to-face exchange create the most durable forms of learning (Marshall and Peters 1985). Information that is rooted in science has always benefited from these direct exchanges, witnessed by the ongoing significance of professional conferences and scientific associations. However, systematic exchanges between scientists and the lay populations have been less than thoroughly applied. If there is a desire to have recommendations from BEMRP be adopted, or at least to catalyze ideas on opportunities for action, these recommendations must come in direct contact with those managers and citizens that will carry out or be affected by these actions. Thus, this research brings information directly to selected groups within the Bitterroot Valley that are prepared to offer suggestions on how public and private forest lands may be managed.

METHODS

The research team adopted a two-stage approach to assess the effectiveness of BEMRP information in the generation of ideas for action. The first stage involved the production and circulation of a simple, written synthesis of BEMRP research results, and the second stage engaged three existing groups in the Bitterroot in a structured, face-to-face dialogue over the contribution of this research toward the identification of on-the-ground actions. In terms of data gathering efficiency, each group served the function of a focus group, and focus group methodologies of directed questions, researcher-driven facilitation, and record keeping of the content of discourse were applied (Morgan 1998). The first stage of the research process was completed in the winter of 1998-99, and the second stage was conducted from March - June 1999.

The generation of a synthesis of BEMRP research was one of the early objectives of this study, as it was recognized that information in the multiple research focus areas had not been assembled in a format that was readily available to a citizen audience. At first, all four focus areas of the BEMRP project were considered for the synthesis, but upon consultation with the BEMRP leadership, the research team decided to address only those studies that had application to "on the ground actions." Prior contact with volunteer organizations in the Bitterroot Valley highlighted the predisposition of many groups to emphasize planning and decision-making procedures when queried about preferred actions on the Bitterroot National Forest. Since this research wished to stimulate the consideration of specific management actions on altered ecosystems, the modifier "on-the-ground" was utilized to describe actions in all communications. Moreover, the human dimensions studies were being independently summarized and synthesized under

a separate BEMRP project (McCool and others 1999), and these studies thoroughly examined elements of planning processes.

The research team worked with the BEMRP science staff to collect, read, and categorize each of the studies in the BEMRP project that were sufficiently complete by January 1999 to be potential candidates for inclusion in a synthesis document. The selection of studies to include in the synthesis was left to the discretion of the research team. We chose 14 research projects in total for the synthesis document, based on our judgement of the study's content. In general, we selected studies that examined resource conditions and the consequences of experimental interventions, leaving out methodological research that explored, for example, means to monitor wildlife or computer simulations to simulate landscape change.

The research team took the available written material on the 14 selected research projects and produced short draft summaries of each of the projects. The summaries are not dissimilar from lengthy abstracts, as they articulate the purpose and scope of the study and the major findings and conclusions. Each draft summary was sent to the study's author for verification and editing, along with a request for available photographs that could serve as visual stimuli to readers. Edited versions were compiled into a single text, organized along three major categories: fire, vegetation, and wildlife. The revised synthesis report was reviewed once again by the BEMRP leadership group before being prepared as a final document (Appendix A).

During the same period of producing the synthesis document, the research team contacted administrators from the Bitterroot National Forest to describe the project and our intent to convene focus groups during the winter and spring of 1999. Since managers of the Bitterroot National Forest are already invested in the results of BEMRP research, the leadership team of the Bitterroot National Forest was the top priority for a focus group. Based on the available resources within the research project, we decided to test two active, voluntary associations to reflect the genuine organizational environment through which scientific information could flow in the Bitterroot Valley. Groups were selected as a purposeful sample (Miller and Dingwall 1997, Babbie 1989) to reflect a spectrum of value orientations toward the use of natural resources. Initial suggestions of volunteer organizations to serve as focus groups were reviewed by administrators from the Bitterroot National Forest, who offered suggestions to modify the original candidates. In the end, the research targeted three groups: the leadership team of the Bitterroot National Forest, the Friends of the Bitterroot, and the Residential/Wildland Interface Fire Task Force. The latter two groups are citizen groups, well recognized for their advocacy within the region on natural resources issues. Members of the Friends of the Bitterroot (FOB) push for minimal human impacts on public lands to afford environmental protection, while the Residential/Wildland Interface group (R/WI) is oriented toward the use of natural resources for human benefit.

The research team applied a three step process to work with focus groups. First, through participant observation of the operation of the groups; second, via the administration of a simple before/after questionnaire to each group; and third, via the sponsorship and

analysis of structured conversations (dialogue sessions) between a small set of BEMRP scientists and participants in the three groups. Each step allowed data to emerge from the groups, either in written or verbal form, that could help uncover those factors that allow BEMRP science information to influence citizens and managers.

In the fall of 1998 the research team attended regularly scheduled meetings of the R/WI and the FOB to observe the operations of the groups and to introduce to group members the intent of the research project. Contact had already been made with individual managers of the Bitterroot National Forest to assure their participation. Each group agreed to take part in the study, and members welcomed the opportunity to review the synthesis document. Copies of the final version of the synthesis document were mailed to all the members on the groups' mailing lists, with a cover letter that offered additional details on the research project. In addition, researchers that had participated in the 14 studies within the synthesis document were notified of the project's desire to enlist a small number of them to attend future interactive sessions to discuss the BEMRP research. The five scientists that eventually attended dialogue sessions were selected based on a balance between their availability and a desire to have different types of disciplines represented (wildlife biologists, landscape ecologists, and fire ecologists). Two scientists participated in the focus group with managers, one scientist attended the dialogue session with the FOB, and two attended the meeting with the Residential/Wildland Interface group.

An initial and follow-up questionnaire were developed for each of the focus groups involved (Appendix B). Through identically worded questions, the questionnaire segregated responses on priorities for action by the two primary land ownership categories in the valley. It asked participants to identify priority actions on both the Bitterroot National Forest and private lands in the Bitterroot Valley. For each type of ownership, a follow-up question was asked on the specific place where these actions should occur. Subsequent questions addressed four other areas of interest: (1) where actions should be constrained, posed as "specific places where nature should be allowed to take its course;" (2) Wildlife species and their habitats; (3) Vegetation management needs; and (4) Effective means to distribute research information.

In the first interactive session with each group, the research team simply reiterated the purpose of the research and administered the initial questionnaire. The responses on this questionnaire were transcribed onto to single form, and along with the synthesis document, results were mailed to all the participants in each of the groups. In the follow-up, or dialogue session, the research team attended the meeting accompanied by one or two BEMRP researchers. Following a structured protocol (Morgan 1998), the research team facilitated the discussions between the researchers and the group participants. Dialogue sessions were tape recorded so that content analysis could be performed subsequent to the sessions. These conversations provided key sources of data on the rationale and underlying sentiments of participants regarding opportunities for action.

The mangers group consisted of the Forest Supervisor and the three District Rangers of the Bitterroot National Forest. They held two special meetings to participate in this

research. There were four (N=4) fully completed questionnaires included in the analysis. The Friends of the Bitterroot (FOB) group is the smaller of the two volunteer organizations tested. Their meetings typically have 10-15 participants. There were no agency staff as evident, regular participants. There were nine (N=9) fully completed questionnaires from the FOB included in the analysis. The Residential/Wildland Interface (R/WI) interface group is the larger of the two volunteer organizations tested, with a mailing list membership of 47 people. Their meetings typically have 10-20 participants, with a mix of citizens, staff from the Forest Service, and representatives of other state and county agencies. There were eleven (N=11) fully completed questionnaires from the R/WI included in the analysis. In the managers group and the FOB, there was one new participant at the follow-up session that substituted for an individual that had completed an initial questionnaire. At the R/WI group, there were two such substitutes. Since responses were aggregated within each of the groups, the research team concluded that these substitutions were small enough in number to keep from swaying group results.

To analyze the effectiveness of the dialogue with the scientists, the research team utilized their field notes from participant observations, the results of the initial and follow-up questionnaires, and a content analysis of the commentaries in the dialogue sessions. The questionnaires provided the foundation for understanding the preferences of each of the groups for on-the-ground actions, as well as a measure of change between the initial and follow-up sessions. Written responses from each questionnaire were typed and categorized to follow the domains of interest, and patterns of language and frequency of responses allowed emphasis to become explicit (Miles and Huberman 1984). The research team compared the initial and follow-up responses based on thematic content, following protocols identified by Krueger (1998). Viewing the displays of initial and follow-up responses allowed observation of any changes based on contact with the research information and dialogue sessions with researchers.

Transcriptions of the audio tapes from dialogue sessions captured the attitudes and beliefs of participants surrounding recommended actions. Individual responses within groups were aggregated by theme, so that statements that could be organized as units of meaning (Flick 1998). The frequency of comments, the tone of speech, and the sequence of responses provided insight on the relative importance of concepts. Each of the two members of the research team independently reviewed transcripts and compared statements that represented individual themes, arriving at agreement on those statements that best captured the concepts of interest to participants. In addition, since both members of the research team attended the dialogue session, field notes provided support for the meanings and emphasis among statements made by participants. Participant observation allows for confirmation of textual data that express the intensity of interests and the intra-group dynamics that affect responses (Babbie 1989). Based on the combination of field notes, questionnaire results, and narrative comments from the dialogue sessions, the research team was able to interpret the preferences for each group for on-the-ground actions, as well as evaluate of the effects of joining science information and scientists into a conversation on these preferences.

FINDINGS

The major finding within this research is that dialogue within each of the three groups had little effect on people's preferences for on-the-ground actions. Interaction with scientists in each of the groups did not change the major areas of emphasis or the thematic domains of interest of any of the three groups. In comparing initial and follow-up responses to questionnaires, there is a striking similarity in the preferences identified and the frequency of the mention of concepts. Terms utilized, word order, and thematic content are nearly identical in some cases. All three groups maintained their initial priorities with only minor changes. The flow and content of discussions did, however, have an effect on the frequency of mention of a few of the items identified as opportunities for on-the-ground actions. For example, the Residential/Wildland Interface group had three more people mention bird habitat as important after their interactions with a BEMRP wildlife biologist. Yet the dominant categories of interest remained unchanged. In addition, the queries regarding "important things to happen on the ground" revealed an ongoing uncertainty about the goals for the management of the Bitterroot National Forest, resulting in multiple, strategic responses that are more akin to advocacy than the adoption of management opportunities suggested by scientific research.

Tables 1, 2, 3, and 4 display the results from the questionnaires for the initial and follow-up sessions for each of the three groups participating in the study. Each group identified, in their own terms, actions that they believed were most important on the Bitterroot National Forest and on private lands in the Bitterroot Valley. In addition, groups responded to questions on priorities for wildlife species and habitats, and vegetation treatments. The one question that explored "specific places where nature should be allowed to take its course" resulted in several respondents displaying confusion about the intent of the question. Most respondents gave very general answers, such as "Roadless," or "Wilderness" (even though wilderness areas had been identified in the question as the one category of land that should not be considered). The research team decided to drop the question as too confusing to lead to valid results.

The tables also pair suggestions for on-the-ground actions with those places where actions should be applied. Respondents were asked to identify those specific places where actions should take place, but in the over 150 individual responses regarding actions on public or private lands, only one response actually mentioned a place name (the Rye Creek acquisition). Typically, places were only generally described, such as "the urban interface." Considering the salience of specific, named places in the creation of expectations for appropriate actions (Williams 1995), it is somewhat surprising that people within the study, even when prompted, were unable to articulate specific locations for activities.

Table 1: Responses to opportunities for on-the-ground action, Bitterroot National Forest

Responses (I = initial response, F = follow-up response)

Opportunities on the Bitterroot National Forest		***Frequency of mention***					
Type of action	***Places to apply***	**BNF**		**FOB**		**R/WI**	
		I	**F**	**I**	**F**	**I**	**F**
Prescribed fire	Ponderosa pine zone	2					
	Unspecified areas	2	2			1	1
	Urban interface	2	2			2	6
	Whitebark pine zone	1	1				
	Winter range		1				
Harvest and Rx fire	Unspecified	1	1				
Timber harvest	Unspecified					6	9
Watershed rehabilitation	Unspecified	2	1			1	
	Rye Creek acquisition	1					
Rehabilitate damaged areas	All Nat'l Forest land			2	3		
	Overgrazed, logged areas			2			
Ponderosa pine restoration	Ponderosa pine zone						1
Cutting/mulching undergrowth	Unspecified			1			
	Sensitive areas			1			
Weed treatments	Unspecified	2	3	1		1	3
Recreational improvement	Unspecified	2	3			2	1
Road inventory	Forest-wide	1					
Road obliteration	Forest-wide			1	3		
Road management	Forest-wide					1	
Monitoring	Unspecified						1
Educational demos	Unspecified					1	
No actions whatsoever	All areas			3	4		

For each of the groups that were queried about priorities for on-the-ground actions, respondents tended to mention goals much more frequently than actions (for example, "Protect and conserve natural states" is one such goal statement received, while "Cutting and mulching of extensive undergrowth" is an action). Since this study is more concerned with potential actions than goals, statements that were simply expressions of goals were not tabulated. Woven into some goal-like responses, however, were indications of recommended actions, and these were extracted and categorized.

Table 2: Responses to opportunities for on-the-ground action: Private land

Opportunities on Private Land		*Frequency of mention*					
Type of action	*Places to apply*	BNF		FOB		R/WI	
		I	F	I	F	I	F
Land management planning	Ravalli Country	6	5	3	1	2	4
	Prime agricultural land					1	
Watershed rehabilitation	Riparian areas	1	1	2	2	3	3
	Unspecified			1			
Road rehabilitation	Unspecified			1			
Fire reintroduction/Rx fire	Urban interface	2					3
	Unspecified						1
Weed treatments	Unspecified	2	1	1	1	1	4
	Road sides					1	
Grazing control	Urban interface					1	
Wildlife habitat improvement	Riparian corridors			1			
	Urban interface	2					
Timber harvests	Unspecified						2
Conservation easements	Urban interface		1				
Cooperative organizations	Unspecified						1
Stop agro-chemicals	Unspecified				1		
Grassland restoration	Unspecified				3		

Table 3: Responses to opportunities for vegetation management

Type of vegetation	Frequency of mention					
	BNF		FOB		R/WI	
	I	F	I	F	I	F
Noxious weeds	2	4	2	1	6	5
Quality of winter range	1					
Riparian vegetation	1	1				
Grasslands						2
Native grasslands			3			
Old growth and snags		1	1	1		
Excessive emphasis on old growth					1	1
Marketable timber					1	
Ponderosa pine						1
Mistletoe areas						1

Table 4: Responses to opportunities for wildlife

Responses (I = initial response, F = follow-up response)

Wildlife species and habitats of concern	**Frequency of mention**					
Type of species	**BNF**		**FOB**		**R/WI**	
	I	**F**	**I**	**F**	**I**	**F**
Non-game birds, neotropical birds	3	1		1	1	4
Threatened and endangered (Westslope cutthroat, bull trout)	2	1	2	3	2	
Elk, deer herds	1	1	1		4	5
Predators (wolves, grizzly bear)			4			
Carnivores				1		
Limit/no wolves					2	2
Old growth dependent species			1			
Snag dependent species		1				
"Keystone" species	1	1				
Type of habitat						
Riparian areas	3	4	3	2	4	3
Winter range	1	1			2	5
Old growth	1	1	1	1		
Ponderosa pine	1	1				
Whitebark pine		1				
Wilderness/Wildlands			2	1		
Weed infested areas						2
Grassland understory					1	1
Bird habitats						1
Big game			1			

Table 5 identifies those actions that were mentioned by more than one group. Even with strongly different value orientations, it is noteworthy that there are several areas of agreement on priority actions. Most notably, the three groups converge on opportunities on private lands much more than public lands. There also appears to be agreement across groups on the importance of riparian areas as wildlife habitat, and the need to treat noxious weeds. However, like other recommended actions, those items where there may be agreement across groups were not changed by the review of the synthesis document or the single dialogue session with BEMRP scientists.

Table 5: Responses common across more than one focus group

Responses (I = initial response, F = follow-up response)

Opportunities for action		***Frequency of mention***					
Type of action	***Places to apply***	**BNF**		**FOB**		**R/WI**	
Bitterroot National Forest		**I**	**F**	**I**	**F**	**I**	**F**
Prescribed fire	Unspecified areas	2	2			1	1
	Urban interface	2	2			2	6
Watershed rehabilitation	Unspecified	2	1			1	
Weed treatments	Unspecified	2	3	1		1	3
Recreational improvement	Unspecified	2	3			2	1
On Private Land							
Land management planning	Ravalli Country	6	5	3	1	2	4
Watershed rehabilitation	Riparian areas	1	1	2	2	3	3
Weed treatments	Unspecified	2	1	1	1	1	4
Wildlife species and habitats of concern							
Type of species							
Non-game birds, neotropical birds		3	1		1	1	4
Threatened and endangered (Westslope cutthroat, bull trout)		2	1		3	2	
Elk, deer herds		1	1	1		4	5
Type of habitat							
Riparian areas		3	4	3	2	4	3
Winter range		1	1			2	5
Old growth		1	1	1	1		
Vegetation issues of concern							
Type of vegetation							
Noxious weeds		2	4	2	1	6	5
Old growth and snags			1	1	1		

To obtain a clearer indication of the priorities for groups for on-the-ground actions and the roots of these preferences, findings have been segregated for display by each of the participating focus groups. Included within each of these descriptions are the suggestions that each group made about the role of science in identifying opportunities, as well as means for science information to be communicated to managers and citizens.

Bitterroot National Forest Leadership Team

The forest managers identified potential actions more clearly than any of the other two citizen groups, yet still offered a large proportion of their comments as goals. For example, two of the five written responses to the most important thing to happen on the ground on the Bitterroot National Forest were:

A variety of goods, services, conditions should be produced from the forest. Clean water and air, visual variety, recreational opportunities, wood products, etc. should be produced while at the same time ecosystems are being maintained (functions and processes.)

Folks should get out and enjoy them more! It's only when we move away that we'll realize what a treasure we have in our own back yard.

The general thrust of the managers' approach toward management is an energetic and proactive strategy that would provide multiple benefits from forest lands. This emphasis on intervention in the forest environment was especially evident in the dialogue session that is addressed below. Managers identified on-the-ground actions in a greater variety of locations than any of the other groups, for example, recognizing a need for prescribed fire in the whitebark pine zone. They also utilized more sophisticated terminology in describing their preferences, such as their identification of "keystone" species and "snag dependent" species in their responses on wildlife habitats of concern.

The manager/scientist dialogue session was markedly different than the focus groups conducted with the volunteer organizations, most likely because the individuals involved were all employees of the USDA Forest Service and possessed a common institutional understanding of the administrative conditions under which actions could take place. Personal pronouns "we" and "our" as an identifier of the Forest Service were used by both scientists and managers throughout the session, as well as relatively obscure acronyms. People external to the Forest Service were frequently referred to as "publics."

Not unlike the participants in the citizen volunteer groups, managers expressed some frustration in making manifest those actions that they believed important. Their desire to exert management trials, even under conditions of uncertainty, was highly evident.

And do you stop the world from turning until you try to collect that? (more scientific information) And I don't think any of us would do that; there's too much you lose by not taking some action.

We don't have everything we need, but we have enough to move ahead without knowing everything, because sitting here doing nothing is maybe the worst choice of all.

Energetic interventions in forest settings were especially favored by managers as an effort to "restore" natural resource conditions within the Bitterroot Valley. The most dominant disturbance mechanism of the past, fire, clearly emerged as the preferred method to carry

out the restoration objective. Knowing that one of the scientists attending was a fire ecologist, a manager directed an early comment to the two scientists.

In terms of priorities on the Forest, we're fairly congruent on weeds and fire. Is that square with what you know?

The fire ecologist had ample opportunity to be able to reconfirm the priority of fire, with several observations that made fire appear as the only viable choice for ecosystem management.

"Fire (is important) from the standpoint of maintaining processes. I think fire is one of the main engines that drives the whole system, and the more constrained we are from letting fire be a natural part of the system, the less effective we are in maintaining the processes."

Scientists and managers alike mentioned a strong sense of responsibility to address emerging problems. The participating scientists, in particular, viewed their role as the advance warning system to illuminate problems that may be only beginning to be perceived by the public.

"Every time we talk about fire we have to talk about weeds. It seems like we've lost the battle with knapweed, but there are other exotics, cinquefoil, starthistle, and spurge. The public consciousness is not even, they are not even on their radar screens at all. But they're on ours, and there is an opportunity to make a distinct change, to make a real effect, to not allow the spurge and starthistle to follow the knapweed model. We have good research on this. Excellent research."

Managers indicated a sense of responsibility as well, and they believe that science information has reinforced some old priorities, such as fire suppression, to shore up their emphasis on protecting resources on both public and private land.

"I'm familiar with a bunch more, some areas of old growth pine, where we could just sit and watch them burn up...or we can figure out a way to prolong their life... some places near Darby along the interface are just disasters waiting to happen. And hopefully we can prevent fire from coming out, off of the National Forests and coming onto private."

The emphasis on the reintroduction of fire may be making some progress in the Bitterroot, since the prescribed fire program has been more widespread in recent years. Simultaneously, the agency is getting more accustomed to addressing the issue with the public.

"The marked difference to me from last year to this year is that people would call and they would say we know why you are doing this (prescribed fire) and we don't like it. And last year, they didn't have a clue why we were doing it, and they really didn't like it. You can talk to them in a way that wasn't possible last year."

Managers also expressed some of their own difficulties in converting scientific information into action, one of these being the available time to absorb the information.

"A big part of the dilemma for me is how to access and absorb what wisdom is out there in research already. It becomes this information overload of not ever having the time to learn from what you all are learning."

But they also identified the vital nature of research for guidance to management actions.

"Science has given us the playing field to go on ... in terms of naturalness, (it's) helping us define what the playing field is and isn't. It's also giving us some sense of what the consequences are of disregarding the natural processes...It's something we can't live without. We'd be shooting in the dark without it."

Managers were also cognizant of the many factors that made science predictions difficult to address. The rapid movement of people into the Bitterroot Valley is a trend that makes the effort to mimic natural processes very difficult.

"I think a better question is what science is not giving us. That isn't natural. (What about) 35,000 people? How do you deal with that? How do you line that up with the sideboards that science does give you?"

The forest managers offered two primary recommendations for clarifying opportunities for action and for effectively distributing that information. "Educating" the public about land management was mentioned several times, although specific suggestions were limited to brochures and public field trips. This education would serve two purposes: guiding individual decisions and encouraging support for management actions. The managers also suggested that scientists take an even more active role in communicating research information. Suggestions included a synthesis of research findings "endorsed by the scientific community," conferences, and research efforts directed at validating management practices.

The Friends of the Bitterroot

The responses from the Friends of the Bitterroot (FOB) were the most goal-directed of any of the focus groups. Their identification of potential actions was the weakest of the three groups examined, largely because they expressed a strong, philosophical orientation toward allowing natural processes to take their course. This predisposition toward naturalness within the FOB was coupled with a deep skepticism of the motives and the capabilities of the Forest Service. These tendencies were strongly evident throughout the dialogue session and in the responses in the questionnaire. For example, when asked in the questionnaire on the most important things to happen on the ground on the Bitterroot National Forests, the highest frequency responses were for no actions at all, or for the rehabilitation of damaged areas.

"First, do no harm! We should not do as much as possible. What action is done should be to mitigate damage done by past harmful action."

"Leave it alone to heal."

"Restore the damage that has been done to the watersheds, fisheries, and streams, wildlife habitat and wildlife, and the forest by excessive clear cutting and over cutting the timber."

Members of the FOB were the only ones of the three groups that mentioned "road obliteration" as a priority. The Forest Service managers and members of the R/WI group mentioned roads as an area for action, but either in terms of inventory or management, respectively. FOB members were also unique in their identification of predators as an important group of wildlife species, and more than any other group, emphasized the importance of old growth (by contrast, two respondents in the R/WI complained of an "excessive" emphasis on old growth).

The dialogue session provided an opportunity for participants in FOB to revisit their goals for the management of the BNF, and to assert how scientific information would reinforce the need for the Forest Service to be re-directed toward environmental protection. Discussions revealed that members of the FOB view themselves as watchdogs to a Forest Service that exercises an agenda to overly manipulate forest resources.

"My big concern is burning. I don't understand it. They have to destroy the forest...it's really hideous...Why do they have to set fires to bring it back to natural conditions?"

Participants in the FOB perceived serious constraints in the capacity of science from BEMRP to contribute to an understanding of appropriate management of the BNF. Their foremost doubt rested in a sentiment that the process of inquiry by scientists had been captured by biased Forest Service administrators, who would not allow researchers to perform sufficient or appropriate research. Arising from highly different expectations for the use of public lands, FOB members believed that scientists in the employ of the Forest Service had tremendous barriers to overcome.

"Over the years our reliance has been in the research branch of the Forest Service ... the hard core scientists in the Forest Service have been a great hope... we have great hope for science, we want to support it, but we don't think that there's any change in what's happening on the land."

Blame for the inability of science to have influence was directed toward the leaders of the agency. Out of a pressing demand to comply to certain policy outcomes, FOB members believe that scientists don't have the ability to perform their work independently.

"It's an example, too, of the wisdom of having an independent research branch....I'm sure if the Forest Service would have had a chance to squelch it, they would have."

"You know what would help this problem a lot? If they'd create an agency of scientific people the Forest Service would not be able to control. The Forest Service would have to listen; they would be a partner to the Forest Service. All the scientific people that are company men, they could be put to marking timber somewhere because they are useless now. They've been brainwashed. They have been browbeat."

An additional concern of group participants was based on the common acknowledgement of the limitations of science in fully describing and predicting outcomes in a complex system.

"There just isn't enough data, enough information, and enough knowledge to make the kinds of predictions that are being made...about the outcome. It's just not there. And I think, to even take a crack at it, you're way under funded."

The FOB participants recognize the value of research conducted by the Forest Service as being very important to the advance of the goals of the group to protect environmental quality.

"Some of the information that you guys are bringing forth right now, when you bring up these issues, like roads, the reason that you know roads are a problem for siltation is because some of the scientific work that has bee done was Forest Service science. They studied the situation and found out that siltatoin was a big problem."

The arrival at the meeting of a Forest Service wildlife biologist, with a strong and articulate penchant for high-quality, objective research, seemed to dispel the harshness of the perceptions of the capture of the scientific process. The FOB participants were receptive to the explanations provided by the BEMRP scientist on the complexities of the interactions between wildlife and vegetation, and they mentioned that they wished that more scientists could come and meet with them.

"It seems like if the scientists want to learn how to better interface with the public, they need to get down here personally and talk to the people and talk to this group and find out what our reservations are and why we're not accepting their research wholeheartedly."

Respondents from the FOB also emphasized educating the public to foster an understanding of natural processes. Suggestions for distributing information included a focus on local outlets, such as newspapers, radio programs, local environmental organizations, the Internet, and field trips. Research was identified by several participants as a tool to support critical evaluation of natural resource management actions, reflecting the group's general lack of confidence in the manner in which land management practices are currently conducted.

Residential/Wildland Interface Group

Like the other two focus groups, responses by R/WI members within the initial and follow-up questionnaires would tie goal statements into recommendations for action. For example, in the question regarding priorities for National Forest lands, 11 out of 27 responses were goal statements. Sometimes goals and actions were mixed into single responses. Other times, respondents were pushing a certain position.

"On the National Forests the Multiple Use/Sustained Yield concept should be paramount."

"On those lands which are designated suitable for timber management, the commercial lands, we should try to extract wood fiber in such a way as to benefit the watershed, minimize negative impacts and be of benefit to communities - employment, improved wildlife habitat, reduce fire danger."

Members of the R/WI group were the only respondents to recommend timber harvests as a priority action. They were strongly concerned about weeds and the need to apply prescribed fires in the urban interface. They mentioned with more frequency than the other groups the importance of elk/deer herds and associated winter range. Members of the R/WI wished to see a much higher intensity of management on public lands, especially if it provided support to local economic interests.

The dialogue session with participants in the R/WI group revolved around the goals for the management of National Forests. In contrast to the FOB group, participants in the R/WI were curious about the contributions that science could make to encourage more interventionist management of the National Forests. The dialogue within the R/WI revealed a common frustration with the Forest Service in regards to their direction of management, albeit for entirely different underlying rationales than expressed by participants in the FOB. The R/WI members wanted to see more management, not less, and one participant emphatically expressed the reason behind an action that several people in the group had identified as a priority:

Get those timber products out of the forests to help our communities develop!

The R/WI members associated the research activities of BEMRP as an extension of the Forest Service, and members doubted that science could do much to overcome policy choices that appeared to be made in opposition to local interests. Throughout the discussion, the group sustained a level of distrust about the capacity of the agency to act in a timely and appropriate fashion. Their major concern, reflected in the strong support for greater timber harvest activities, was that there was not *enough* action (an ironic contrast with the FOB, who saw the very same political process as allowing *too much* action). The R/WI members expressed repeatedly in the dialogue session that distant and ungrounded political processes have captured the agency.

"The Forest Service has some exceptional professionals at the local level. But part of that perception is that with their knowledge, their expertise, and even the scientific community; that there's a decoupling between that and their actual policies that are applied to the ground. The policies are made at a higher political level, and so even when you've got this stuff, you've got mistrust that isn't aimed at all towards these employees. I see pretty darned good respect , there's some public employees that are just really well respected. But when people look out in their community, they keep seeing these decisions being made elsewhere and applied here, and so there's an uprising of county commissioners and others."

Another comment was directly critical of research's affiliation with the Forest Service, and it characterized the skepticism of some members of the group that the research was not wholly independent.

"What I see in forestry is that forestry research is supposed to be directed to prop up or supplement the political decisions that are made on forest management. And they send that down the line to the local foresters and they have to implement the research."

Some R/WI members observed that the science information supported their views of production-oriented management, especially since the synthesis of BEMRP research and prior contacts with Forest Service fire ecologists had emphasized the importance of prescribed fire coupled with timber harvests. However, there was also recognition within the group that science could not be expected to provide all the answers. One specific exchange in the dialogue session demonstrated the potential for science to be contested, and how the complexity of effects could impair a clear path to action. Even the two scientists participating in the dialogue session offered somewhat contrasting views:

"The effects of these treatments (on noxious weeds) have not been studied well enough yet, so there's a whole element that I don't see the scientific community having a good handle on what to do about them. So it's very hard to present what's the opportunity for action because when you ask the experts, we try a lot of things and we're not united and we don't understand exactly how to get rid of these things. There's been some success stories, but with knapweed, there hasn't been one yet." (Next scientist) "I would tend to differ with you here, because there's two reports in here (referring to the synthesis document) of Peter Rice's work, and he's got a lot of experience with noxious weeds, and he's got a lot of very good success in controlling knapweed with chemicals. Excellent success. (First scientist) "He has, but there's also been quite a bit of work done, not in there (the synthesis), that some of the effects of those (treatments) haven't been studied well enough yet, so there's a whole element that needs to be addressed on what are the effects of the chemicals."

Not long after these comments were offered, one of the members of the R/WI group demonstrated that there may be costs borne by members of communities who embrace science findings under uncertainty, such that the skepticism among citizens is understandable.

"That brings us back to the comparison of the scientific stuff relative to the environment that they're in. I mean, smoke from prescribed fire and chemicals and these other things are not part of nature. So we've gone through that, and if you look at a history of the chemicals we use - my dad's truck farm, I mean. He started out with Paris Green - was the first thing they used. It was approved by the Extension Service and everybody else. Arsenic. When they got done with that, then they came along with DDT, and boy, it worked great, and you know that's out. So we had kind of this deal where everybody told us it was safe, we used it, and we did it with the best intentions possible and then found out that, no, the scientific community didn't have it ... I think there's a little bit of that out there in the community at large, that even though we think that we've got a handle on it, we probably really don't."

These doubts about the risks associated with applied research were eventually addressed in a sophisticated manner by the group participants, who moved through a lengthy discussion of the value of joining research with an education program.

"There's a case where you set up a research design as your action program and you get people involved and it becomes the education tool that allows you to educate people and move forward."

People acknowledged the difficulty of the approach to join research and practice, especially in terms of the time it would take to fully evaluate actions. Yet members of the R/WI supported ongoing communication among people to build understanding of what was, at least, provisionally known.

"Maybe we don't have all the answers yet, and I think that's kind of what I hear today; it's what I'm hearing from the scientists: Here's what we do know, and we're still working and still evolving that. So its almost instilling that in people too."

In discussions over the distribution of science information, R/WI members emphasized the importance of teaching land stewardship. One suggestion was to work jointly with school children and adults, so that information could be presented in a manner that would avoid being too technical or confusing. Since information would be presented into a mixed audience of adults and children, adults would not need to feel embarrassed about not having familiarity with basic concepts.

"If you all as scientists and professionals can agree on what you need to teach them, you could have an excellent program that would raise the awareness of the children and sometimes then the adults...and I think this area having, what, 75% public lands, is kind of unusual, and it should be a focus in the school in how do you live an interact and manage these lands."

Suggestions for circulating scientific information also emphasized local means, including workshops, seminars, public events, television, radio, newspapers and brochures.

DISCUSSION

The limited change in priorities or new ideas stimulated by the focus groups can be addressed by revisited the parameters identified by Muth and Hendee (1980) as vital to the adoption of innovations. In three key areas, trust, observabiltiy, and trialability, the single event focus groups were unable to overcome existing conceptual biases or a deeply skeptical relationship between the Forest Service and local citizens. The structural limitations of the focus group format and the inability of people to actually observe science trials on the ground made it difficult to affect substantive change in people's preferences for action.

As Muth and Hendee observed, the effectiveness of the transfer of information requires some convergence of values between the agents making the communication exchange. Most clearly, there remains a deep and underlying mistrust of the Forest Service by the Friends of the Bitterroot, and it will be very difficult to overcome this barrier. Similarly, the R/WI members sense that those that exert power within the Forest Service are also not to be trusted, that they will make decisions that fall against the interests of rural peoples (local level agency staff were specifically identified as being reasonable public servants, but powerless within the agency). How scientists fit into the agency itself becomes a critical issue for the development of trust and the subsequent transfer of ideas and findings.

It may be argued that trust could develop over time through a sequence of face-to-face interactions, since there would be opportunity to build relationships (Daniels and Walker 1996). Indeed, the research team did observe a certain warming to the presentation of the BEMRP wildlife biologist within the FOB session, even though the group criticized the agency on multiple occasions. In addition, the embrace of bird habitat improvements by R/WI participants after their dialogue session with the BEMRP wildlife biologist indicate that people can be receptive to ideas presented to them in direct exchanges.

Trust does not simply depend, however, on contact with an individual; it also extends to the institution that is represented. Both the R/WI and the FOB, for entirely different reasons, believed that the Forest Service had abandoned its responsibilities, yet they could show affinity for individual researchers. Frequency of contact is also not a guarantee of trust. FOB members commented that they had experienced repeated encounters with the Forest Service staff in the Stevensville West Central process, yet were ultimately dissatisfied because they felt their points of view were discarded in the final environmental documents. Issues that are important to participants need to be addressed in a substantive and respectful manner.

Elements of the adoption of innovations are mutually reinforcing - new opportunities for action depend on trust *and* observable, trialable examples that demonstrate how something might work. If BEMRP activities had coupled a series of focus group meetings with field trips that modeled successful restoration practices in response to

citizen concerns, there would be a much higher likelihood for science results associated with these activities to generate additional, creative suggestions for action.

Scientific information alone is not the critical element that leads members of interest groups or managers to the point where they can identify actions. People can acquire a great deal of information that may seem relevant, but may still not act (Shindler and Brunson 1999). As Jamieson (1994) observes, "Education is more likely to occur in the context of a personal relationship than in anonymous information provision (26)."

At least the attempt to engage people in personal relationships has had a start through BEMRP activities. BEMRP has sponsored numerous learning events to bring people in direct contact with research information. It may not, however, be enough. The results of this project identify that a single session cannot offer sufficient give-and-take to make substantial headway. An experiment of much longer duration with a more serious resource commitment, on the other hand, may develop different results in terms of people's learning and adoption of new ideas. As one respondent in a focus group commented, "*It's too bad we didn't have more time with more scientists.*"

Repeated contact could also sort out some key interdependencies that discovery affords, for sometimes scientists and citizens come to the same conclusion about a priority action, but for entirely different purposes. For example, in the discussion session with the R/WI group, the wildlife biologist in attendance had described the importance of riparian habitats and the need to change current riparian vegetation patterns with management activity. A R/WI participant, agreed, stating:

"We've heard from that at least once. There's some of us that believe that we have to manage in riparian areas, primarily because we think they are the most productive areas of the forest. And we can't ignore them, they have the best soils, they have the best growing conditions - how can ignore a thing like that?"

Yet the desire to manage habitats stemmed from entirely different sources - one to provide habitat for birds and the other for the production of timber products. Interestingly, the exchange continued, and one landowner piped in that there were other considerations that had to be addresses as well:

"We were already set up, that we were going to do this project (a harvest in riparian areas), but then the price of timber went down, and so it wasn't feasible to do it, so we are still there with... a lot of mess."

An interchange between citizens and scientists allows greater complexity to be overlain on research results. In this case, a landowner demonstrated a different incentive for management than the researcher, but also was able to interject a new variable that landowners are forced to deal with - the exigencies of the marketplace. Scientists confronted with this series of landowner issues could see that their recommendations must operate in competition with other powerful forces that can shift a course of action toward a different outcome. What would be the result in this example, if the riparian

area received a treatment that removed all the large trees to make a timber sale attractive to the market? What is the threshold where large trees should not be removed to sustain wildlife habitat? This is precisely the tradeoff information that R/WI respondents hope that science could provide. And as yet, this type of contribution has yet to become commonplace in the displays emanating from research projects.

Communication is also a problem for scientists and managers when they discuss environmental issues (Brunson 1992). The terms and language used to describe conditions or events commonly come out as jargon. The cause/effect relationships identified within science reports may not be understandable to a lay readership, even if they address the same interests as expressed by citizens. Even the synthesis document produced for this research was critiqued by reviewers as being overly technical, and three respondents in the focus groups complained that the text contained an excess of technical terms.

Adoption of recommendations within science reports face some basic obstacles, especially if these recommendations run counter to traditional priorities. Innovations such as prescribed fires in riparian areas are difficult to accept when they are so new. In the past, riparian areas were places that were "hands-off" to management, not a locale for cutting and burning. Innovations are accepted most readily when based on direct relations to previous experience (the observability criterion), and they are inversely related to previous negative experiences (Rothman 1974). Thus, every bad experience with prescribed fire will linger as a strong disincentive to adoption. A recent negative experience with prescribed fire did recently occur in the Bitterroot Valley in the spring of 1998, when a major dust storm and inversion moved into the area immediately after the Big Creek ignition. Since many people experienced the negative consequences (the smoke and dust) from this event, and very few actually could observe the positive benefits, acceptance of additional prescribed burning will remain a challenge.

Similarly, innovation is directly related to the perceived need for change (Rothman 1974), but when there is disagreement about even the direction of change (notwithstanding it's extent or intensity), there will be enormous problems in making this change manifest. The alignment of innovations with the value orientations of affected parties cannot be over-emphasized. It was evident in this study that the values of the FOB members, even though they support the role of science, were in direct opposition to the changes that several research reports recommended.

The clarity of the potential outcome also affects people's willingness to embrace an innovation. Even through BEMRP research suggested likely outcomes if certain actions were taken, the researchers also performed their duty by recognizing the uncertainties within the system and the complex inter-relationships that could reduce or shift main effects. The study on elk habitat by Koncerak (included in the synthesis document) is an example where the intensity of applied actions may create different outcomes. Although moderate levels of prescribed burning will improve the balance of forage and cover for elk (sufficient hiding cover will remain unburned, while new forage is opened up), large scale burning may reduce cover sufficiently to make elk vulnerable to hunting pressure.

This type of complexity makes it difficult for a lay observer to know what to think. Complexity and uncertainty within a series of applications reduces, instead of increases, the potential for people to identify preferences.

What is particularly sobering about the results of this research is the recognition that those individuals who participate in voluntary associations are generally more innovative than the general population (Rothman 1974). Social participation by volunteers points to creativity. If these volunteers are unable to be stimulated by science information, then it will be very difficult for others to embrace science products as stimulants to new behaviors.

CONCLUSION

The results of this study identify a difficult predicament for managers, scientists, and citizens. The capacity of managers to act in the Bitterroot is deeply impaired by real divisions among citizens over competing goals. However, there are a few areas where citizens, managers, and scientists share concerns (weed management, riparian areas), and these may be touchstones to join research with action. The importance of creating a learning environment for even these converging interests is paramount, since substantial uncertainty remains over the types of actions that could significantly improve altered ecosystems.

Social learning theory is guided by perspectives that argue for effective communication that is combined with action, for only action is sufficiently tangible to be persuasive (Friedman 1987, Shannon 1991). Friedman argues further that learning takes place during the process of "happening", and people can begin the discovery of new opportunities based on what these actions reveal. Direct contact with scientists and managers can help people sort through their own ambiguities and uncertainties about outcomes, and lead to more enriched discussions of the tradeoffs that may be involved in adopting a particular course of action. As Yankelovich (1991) laments, the forums for sorting through the complex issues facing society are notable by their absence. Yet even in a single session, there can be benefits from a structured dialogue among scientists and citizens. The effort by the R/WI to suggest meaningful ways for applied research to be a learning experience for practitioners was an example of the potential for creativity within a setting that joins knowledge-building methods of highly different traditions.

It appears that it would require a very large commitment of time and energy by researchers to engage scientific information in an influential way with citizens. The commitment would not, however, simply involve attending meetings and addressing questions, it also will require additional demonstration sites, field trips, and new types of learning events that are accessible, straightforward, and fun. Information will need to be processed and presented in ways that are much different than the vehicles that currently serve as outlets for communicating research results. The effort would likely require the employment of individuals with specialized communication skills, yet sufficient technical knowledge to extract the key messages from science reports. Researchers cannot be

expected to take on the primary responsibility for doing this work (we have seen in this study that there is little incentive to do so). Researchers are more effective in continuing to conduct the research for which they were trained. On the other hand, a commitment of this type would imply a dedication of a significant amount of nearly every individual researcher's time to review, edit, discuss, and assist in the building of communication products. It would also require a dedication to additional, non-traditional interactions with citizens and managers, since these forms of exchange are so vital to learning.

This new role for the scientist will be something that will require considerable negotiation among science institutions, as they do not commonly adopt large extension-type activities for their science staffs. The capacity of the scientists to work with citizen groups and managers can be severely limited by the other demands of the scientists' work portfolios. There are only infrequent opportunities built into the work schedules of scientists to interact with public organizations, and there are only minimal staff or travel resources to set up the appropriate channels of communication to respond to inquiries and test/respond to suggestions of residents. The alternative, however, is to maintain the current system where scientists, researchers, and managers operate in a system of mutual distrust, which is inimical to learning, creativity, and the progress that must be made to address our common problems.

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APPENDIX A

Bitterroot Ecosystem Management Research Project (BEMRP)

Early Stages of Research: Focus on Findings Related to Potential On-the Ground Actions

Preliminary Synthesis and Summary of the Research

Prepared by the Bolle Center for People and Forests

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and
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Introduction

In its first few years of operation the Bitterroot Ecosystem Management Research Project (BEMRP) has sponsored a variety of research projects to develop a better understanding of the social, economic, and ecological conditions within Montana's Bitterroot Valley. The research has been grouped in four major categories: human dimensions, vegetation, wildlife, and landscape analysis. Within these categories, specific studies have been undertaken to address important questions surrounding natural resource management, and findings from these scientific inquiries have vastly improved our knowledge about this rapidly changing region.

Taken as a whole, these studies show a complex set of inter-relationships among people, land, water, and biophysical processes operating concurrently across geographic scales. They also show that future management of natural resources will inevitably involve a difficult series of choices, since management actions will resonate with short- and long-term consequences. Outcomes of on-the-ground management activities are frequently difficult to predict, and even with accurate forecasting, benefits are often mixed. Actions can create results that may simultaneously support and conflict with values possessed by individual citizens. When we place our choices on real landscapes with their unique histories and unrelenting disturbances, we often find that we have created new and different challenges for the future.

The purpose of this document is to summarize the research that has been undertaken by the BEMRP project and to highlight those studies that provide us information about opportunities for action. The report will not, however, include the results of the Human Dimensions work of BEMRP, since summaries of its investigations can be found under another cover. The Human Dimensions research conducted under BEMRP highlighted the significance of open and understandable administrative processes to make decisions regarding the use of public lands, demonstrating that successful choices depend on successful decision processes. Yet regardless of the manner in which a decision is made, the substance of a decision remains important. This report summarizes the research that informs us of the potential consequences of on-the-ground action.

The types of actions that may be undertaken in the natural resources sector vary greatly. We can see that our actions as well as our choices for inaction have implications. At the same time, we possess only limited capabilities - in terms of time, money, or knowledge - to affect what we wish to change. What we observe in this summary is a set of studies selected by the staff of the Bolle Center that offers significant insight into resource conditions and trends in the Bitterroot Valley. The information in these studies may help us consider potential actions, including efforts for the protection of undisturbed settings. Even with uncertain and incomplete knowledge, we are forced to make choices, and hope we chose wisely. The intent of this document is to provide information so we may choose with the best available knowledge.

The document is organized around several major issues that have guided research in the BEMRP effort. It is not a substitute for the studies themselves, which can be found in current or upcoming publications, or on the web site identified at the end of the report. This

summary is not a complete description of the many studies conducted under BEMRP, but it does provide a place to start when considering what opportunities there may be to take action in the Bitterroot Valley.

BEMRP Synthesis

Fire

Figure 1: Forest structure in 1909.

In the Bitterroot region, there has been a change from the historic fire regime due to fire exclusion over the past 70 years. The suppression of fire has had significant ecological impacts in both low- and high-elevation forests, leading to a variety of concerns regarding the maintenance of prior biotic relationships that depend on a mosaic of vegetative composition and structure.

The historic pattern of frequent low-intensity fires in ponderosa pine and pine-mixed conifer forests prevented more shade tolerant competitors from replacing the shade intolerant, but fire resistant, ponderosa pine. Fire exclusion in these areas has led to the accumulation of surface fuels and conifer thickets that increase the risk of severe stand replacing fires. The loss of ponderosa pine stands is cause for great concern regarding habitat and biodiversity, and the risk of severe fire is dangerous for residential and scenic areas. In addition to these concerns, the dense thickets of small trees now present in the understory are at greater risk of insect and disease epidemics.

Figure 2: Forest structure in 1948.

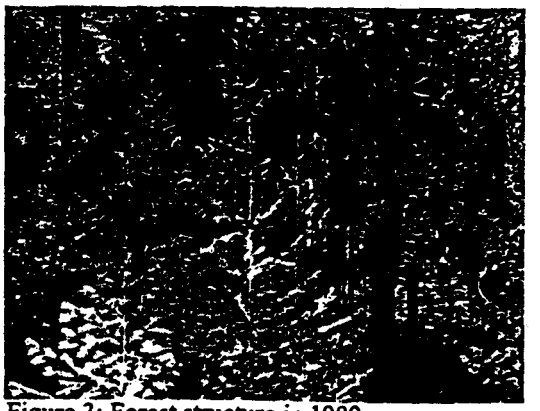


Figure 3: Forest structure in 1989.

Research is being conducted in the Bitterroot to address how fire restoration might be implemented to alleviate some of these problems and return the forests to a state more reminiscent of their past condition. The following information is the result of completed studies regarding fire and its relationship to on-the-ground action.

Age class structure of old growth ponderosa pine/Douglas-fir stands and its relationship to fire history
by Steve Arno, Joe Scott, and Michael Hartwell

This study was conducted on different study-site types (moist, dry) to identify changes in stand structure associated with fire exclusion. The intent was to gain knowledge of how ponderosa pine and its companion species regenerated in association with fire. This knowledge can help further develop strategies to perpetuate ponderosa pine forests. The findings are as follows:

- Frequent, low-severity historic fire on lower elevation, dry sites enabled ponderosa pine to develop a nearly all-aged structure in stands having many different age classes, despite competition from Douglas-fir.
- On a moist site on the Bitterroot National Forest, frequent fire helped maintain a nearly pure ponderosa pine overstory despite competition from both Douglas-fir and grand fir. The pines were long-lived and the stand was multi-aged.
- On moist sites on the Flathead National Forest, ponderosa pine stands became established in even-aged classes after patchy and infrequent stand-replacing disturbances -- evidently fire and bark beetle epidemics.
- On both moist and dry sites, an understory thickets of Douglas-fir developed after fires were suppressed.

The results of this study have implications for strategies that maintain ponderosa pine stands. Treatments should be designed that are consistent with natural processes; reintroducing fire alone will not be sufficient for restoration because the fir understories cannot be killed without damaging the overstory. There is a need to discover the events responsible for the pattern found on Flathead National Forest sites, as well as the natural conditions that predisposed these stands to these disturbances. Unlike recent stand replacement fires, the historical stand replacing fires left ponderosa pine as the primary surviving tree in surrounding stands, which allowed pine to reseed.

Restoration of fire in inland forests
Lead author Steve Arno and others

This report is a compilation of articles regarding the use of fire in forest restoration, with an introduction by Steve Arno. The four authors address the previous elimination of fire and current attempts to restore some of the effects of the historic fire pattern. Specific issues include goals for fire restoration, silvicultural treatments, and special conditions that result from fire exclusion.

Silvicultural applications: Restoring ecological structure and process in Ponderosa pine forests
by Carl Fiedler

Returning fire to dense stands or those with understory fuels could fatally damage already stressed overstory trees. All the trees are under stress and relatively slow-

growing and weakened by prolonged stagnation. For these reasons, restoring ponderosa pine forests to more healthy and sustainable conditions will generally require some kind of silvicultural treatment. In overstocked second-growth stands, density reduction is the primary treatment required. The initial cutting leaves the largest and healthiest pines to provide site protection and a well-distributed seed source; this is the first step in a long-term restoration effort to develop uneven-age stand structures. Future cuttings would reduce stand density and regenerate pine in newly created openings. The long term goal is creating and maintaining a multi-age ponderosa pine stand, allowing some overstory trees to reach a very large size and become senescent. In overstocked old-growth stands, two types of cutting are part of the initial harvest. Selection cutting in the overstory is aimed allowing regeneration of a new age class of ponderosa pine and reducing the amount of Douglas-fir and true firs. Simultaneous thinning of the understory (which is largely fir) is also needed. Experience has shown that leave-tree marking results in a superior reserve stand, because the marker focuses on the highest quality trees at an appropriate spacing. With cut-tree marking, the residual stand is comprised of the leftovers.

The long-term objectives of these treatments are to restore a semblance of the historical old-growth stand structure, allow ponderosa pine to regenerate, increase tree vigor, and reduce susceptibility to damaging disease, insects, and fire. Silvicultural cuttings followed by compatible prescribed burning treatments comprise an integrated system for initiating the first phase of restoration. It is critical that pretreatment conditions and prescribed cutting treatments be documented, and that the target stand or desired future condition be described in terms of density, structure, and species composition. Documentation allows for monitoring as well as alteration or refinement of treatments for long-term restoration objectives.

Prescribed fire applications: Restoring ecological structure and process in ponderosa pine forests
by Michael Harrington

The author identified a series of potential management activities under which fire prescriptions could be developed and applied. The objectives might be:

- To reduce the unusually high levels of accumulated organic matter fuels to lessen the potential for severe wildfire.
- To reduce the typically high numbers of small conifers that contribute to the wildfire hazard and severe competition for limited resources.
- To stimulate the vigor of shrubs and herbaceous plants.
- To partially consume forest floor organic material, resulting in mineral soil seedbeds that are generally required for natural regeneration of seral species.

Prescribed fire may serve as an ecologically sound treatment to consider for meeting these objectives. It helps restore those forests that depended on fire in the past, but should be closely linked to other silvicultural goals.

Reestablishing fire-adapted communities to riparian forests in the ponderosa pine zone
by Matthew Arno

Many streamside and riparian areas within the ponderosa pine zone support vegetation very different from historical conditions, due to fire exclusion. Historic fire patterns helped maintain a diversity of plant species far exceeding that found in adjacent upland forests and established rich wildlife habitat. In contrast, current conditions include dense thickets of small firs and a buildup of downed fuels, allowing modern wildfires to sweep through streamside forests. These high intensity burns leave little vegetation to protect streambanks and water quality. Three restoration treatments are being compared in the Lolo and Bitterroot National Forests to create conditions that will allow a return of historic vegetation patterns and to reduce the hazards of severe wildfire and insect or disease epidemics. The treatments include mechanical thinning, mechanical thinning followed by understory burning, and an untreated control.

Whitebark pine ecosystem restoration in western Montana
by Robert Keane and Steve Arno

Whitebark pine is a major tree species of upper subalpine forests of the northern Rocky Mountains, and provides important nutritional and structural components of wildlife habitat. A rapid decline in whitebark pine has occurred during the last 60 years as the result of mountain pine beetle epidemics, white pine blister rust, and successional replacement by shade-tolerant conifers such as subalpine fir as a result of fire exclusion. Whitebark pine benefits from fire because it is able to survive low severity fires, and it can colonize large burned areas better than its associated shade-tolerant trees, due to seed dispersal by the bird Clark's nutcracker. Restoration suggestions include cutting trees that compete with whitebark pine, prescribed burning, and planting of rust-resistant seedlings. These practices are now being tested in five study areas in western Montana and Idaho.

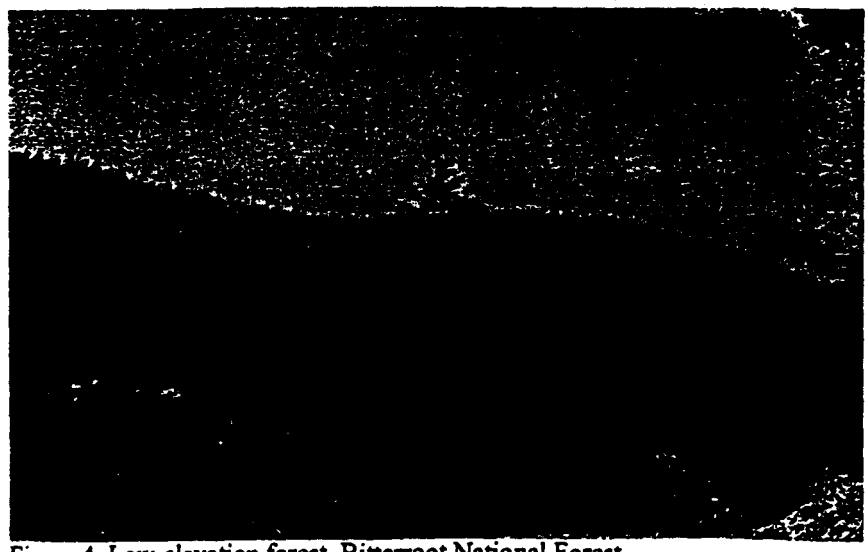


Figure 4: Low-elevation forest, Bitterroot National Forest

Reducing forest fire hazard in residential and scenic areas: a case study comparing three treatments in a western Montana ponderosa pine stand

by Joe Scott

The health and aesthetics of low-elevation (second-growth) ponderosa pine are at risk due to the potential for severe wildfire damage in this forest type. The author proposes that the management of public and private lands with high social value should attempt to minimize risk of fire damage while maintaining aesthetic qualities. Private landowners and members of the public are often wary of Forest Service attempts to apply hazard reduction treatments to high value, visually-sensitive recreational areas. This study attempts to clarify the degree to which different fire hazard reduction treatments affect the following: the threat of severe fire damage, the changes in visual quality, and the cost and revenue associated with various alternative treatments. Three treatments were applied and evaluated in a low-elevation ponderosa pine stand:

- Minimum impact treatment - light commercial thinning from below, with slash hand-piled and burned.
- Revenue production treatment - moderate commercial thinning from above, with whole-tree harvest.
- Forest restoration treatment - moderate commercial thinning from below, with broadcast burn.

The minimum impact treatment was highly favored for aesthetic quality, was moderately effective in reducing fire hazard, and produced a small net income. The revenue production treatment produced more income than other treatments, was effective at reducing fire hazard by thinning the overstory, and ranked high aesthetically. The forest restoration treatment was most effective in reducing wildfire hazard, and it produced a modest net income; the aesthetic quality suffered, however, with the charring of tree boles due to broadcast burning. The first treatment may be favored for small, private, residential property where aesthetic values are high and stand densities are maintained for privacy reasons. Treatment two may be appropriate on a wide range of public and private land. The third treatment also has broad applicability, but individuals will have to consider its aesthetic implications.

Determining the effects of fire restoration on elk winter range and hiding cover

by William Koncerak

Figure 5: Elk in winter landscape.

Fire suppression has produced significant changes in Bitterroot plant communities, resulting in overstocked stands and decreased forage in the understory. The Bitterroot National Forest is attempting to restore fire as a natural process, which will affect existing elk populations due to changes in hiding cover and winter range forage. Prescribed burning significantly reduces hiding cover for elk, but can also increase the cover of forage on winter

ranges composed principally of grasses. No significant shrub response was detected. The increase in forage plants occurring after the burn remained above levels in unburned areas for approximately ten years. Models that forecast the potential use of an area by elk show dramatic increases after prescribed burning until an area threshold is reached. Once the threshold is surpassed, use potential experiences a sharp decline.

The findings of this study suggest that a balance between cover and forage is essential. Although prescribed burning reduces hiding cover, these reduced values may not be significant since a large percentage of the landscape is presently occupied by dense vegetation. With large scale prescribed burning, the loss of cover may eventually outweigh the benefit of increased forage.

Noxious Weeds

Spotted knapweed is an exotic forb invading grasslands and early successional forests in the Northern Rockies. This invader causes reduced vigor of native plant populations, less plant diversity, and economic losses due to reduced livestock production. BEMRP has initiated research to examine the concerns surrounding spotted knapweed, and the following information is the result of completed studies.

Elk winter forage enhancement by herbicide control of spotted knapweed

by Peter Rice, J. Christopher Toney, Donald Bedunah, and Clinton Carlson

Spotted knapweed has low nutritive value and low palatability to elk. Its dominance on disturbed sites and natural grassland has decreased forage value and availability and may lower the carrying capacity of winter range for elk. This research used a forage value index expressing both the seasonal availability of plants and the selection behavior of elk on winter range sites. Three years after herbicide spraying, all treatments averaged greater elk forage value than unsprayed plots. The herbicide treatments resulted in biomass shifts from spotted knapweed to more palatable forage and occurred with little impact on plant community diversity. Increasing the amount of available forage is important when adverse conditions require elk to remain on winter range for longer than normal, and the increasing number of people moving into winter range areas requires that the remaining areas be optimally productive. An increased vigor of native grasses can decrease the overall impact of high animal use on vegetation.


Figure 6: Spotted knapweed.

Plant community diversity after herbicide control of spotted knapweed
by Peter Rice, Donald Bedunah, and Clinton Carlson

Spotted knapweed is susceptible to herbicide control, but there are concerns that application will result in the elimination of native forbs and the creation of grass monocultures. Three years after herbicide treatment, treated plots contained plant diversity as high or higher than the untreated plots, and spotted knapweed was being controlled 53-90%, depending on the treatment applied. Overall, the impact of herbicides on diversity was small and transitory, and herbicide residues in the soil declined rapidly with time and depth. Suppression of spotted knapweed releases resources to support the growth of other species; the grasses and forbs inherently tolerant to the herbicides are able to respond immediately, while susceptible species respond in subsequent growing seasons as the herbicide residuals decline.

Habitat Concerns

Several habitat and conservation concerns are facing the Bitterroot region, many of which relate directly to proposed management and stewardship activities. Habitat distribution and fragmentation have significant impact on wildlife populations. Attempts to reestablish historic ecosystem functions will result in landscape level changes in vegetation, which will strongly affect existing animal communities. The following studies addressed those wildlife habitat concerns.

Conservation implications of a multi-scale study of flammulated owl habitat use in the northern Rocky Mountains, USA
by Vita Wright, Sallie Hejl, and Richard Hutto

Bird distribution is highly dependent on the distribution of suitable habitat. For this reason, identifying and maintaining adequate amounts of suitable habitat are critical to supporting the population sizes and distributions necessary for long-term species viability. This study

found flammulated owls, rare species, using mature and old-growth ponderosa pine/Douglas-fir stands disproportionately more than young ponderosa pine/Douglas-fir stands or other coniferous forest types. Some local-scale suitable habitat remained unoccupied, possibly because it occurred in unsuitable landscapes. Because flammulated owls often occur in association with other flammulated owls, this finding may be related to social requirements. Selecting landscapes with an abundance of ponderosa pine/Douglas-fir stands may also increase the owls' chance of finding suitable nest sites.

This finding suggests targeting the stands of old-growth ponderosa pine as potential flammulated owl habitat must consider the context of the landscapes in which those stands occur. It may be most effective to manage habitat within a landscape with an abundance of suitable forest types (ponderosa pine/Douglas-fir). Areas with an abundance of young ponderosa pine/Douglas-fir could be managed as potential future habitat by allowing some of the stands to return to late successional stages. Even within suitable landscapes, all ponderosa pine forest types are not suitable for flammulated owls. This suggests that within suitable landscapes, it may be most effective to conserve and restore stand structural characteristics within suitable habitat types rather than within any ponderosa pine forest stand. Flammulated owls do not occur in recently clearcut forests, but do occupy selectively logged stands. Further studies should be done to compare reproductive success and survivorship between owls in unlogged and selectively logged forest before comparing the habitat quality of unlogged and selectively logged sites. Large snags provide important nesting locations for flammulated owls. Thus, large ponderosa pine trees at risk of dying could provide future snags which should be retained during selective logging operations.

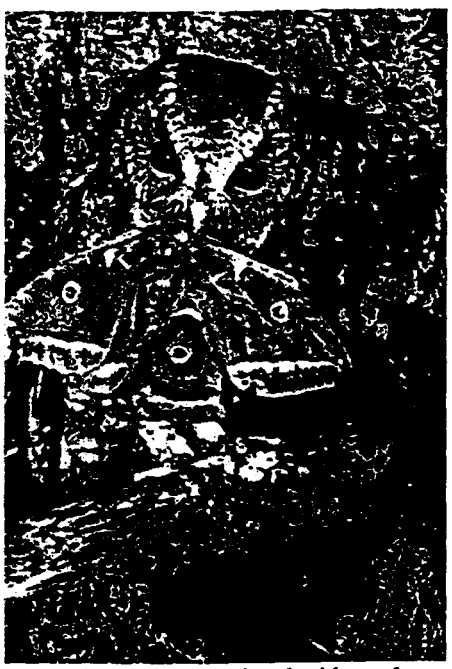


Figure 7: Flammulated owl with moth.

Because these owls eat grass and insects, the elimination of some understory forest would be expected to maintain grassland openings used by foraging owls. However, management activities that eliminate all understory Douglas-fir may remove thickets important for roosting, singing, drop-pounce foraging perches, and predator protection cover.

Riparian forests and avian productivity

by Joshua Tewksbury

This project studied the impact of forest fragmentation over four years in deciduous habitats in the Bitterroot Valley, both to understand the importance of these areas to maintaining regional bird diversity and to examine the effects of landscape change on the breeding productivity of birds in the Bitterroot Valley. The fragmentation of once continuous breeding habitats may be causing declines in many resident and migratory bird populations. The long-term viability of populations existing in fragmented ecosystems may depend on

patch size, edge effects, and composition of the landscape surrounding the habitat fragments. Three impacts have been positively correlated with fragmentation in midwestern and eastern forests: increased nest predation, increased brood parasitism, and decreased pairing success. However, the effects of habitat fragmentation on bird populations in the western U.S. are largely unknown.

More than 110 species were detected through three years of standardized bird surveys. The species composition was quite different between the aspen dominated sites in the foothills of the Bitterroot Mountains and cottonwood dominated sites along the Bitterroot River. However, bird species diversity was significantly higher in all deciduous vegetation compared to coniferous forests; even very small deciduous patches were found to be very important in maintaining regional bird diversity. Nest mortality due to predation is greater in foothill sites embedded within coniferous forest and near the interface between forest and agricultural land. Fragmentation does not always increase nest predation. The predation rates reflect the response of specified predators to landscape change. There is no evidence of patch size affecting predation rates and there is a lack of consistent edge effect.

Cowbird parasitism of nests increased with increasing agricultural activity and decreased with higher forest cover; however, forest cover appears to be only a correlate rather than a driving factor in parasitism pressure. The density of human habitation was the strong predictor of parasitism. Parasitism is also strongly influenced by host density, and the proximity and abundance of cowbird feeding habitats. This research also supports the claim that breeding ground processes may be primarily responsible for declining bird populations. The nesting success of a number of species breeding in these habitats at the edge or within human altered landscapes is likely too low to support viable populations. Species such as the American redstart and the Veery are successful less then 25% of the time, and Swanson's thrush were only successful 13% of the time.

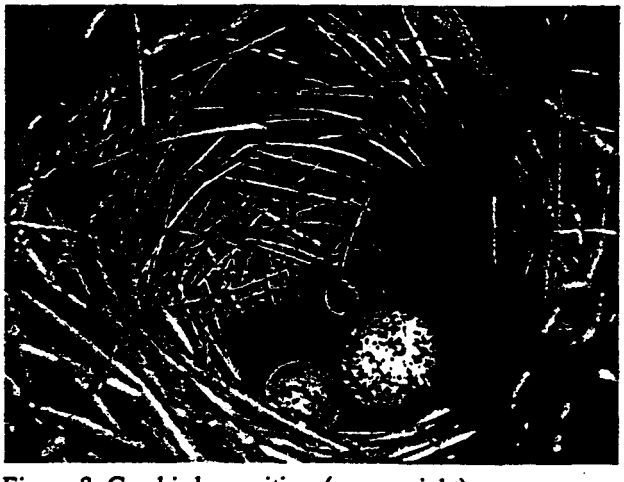


Figure 8: Cowbird parasitism (egg on right)

Deciduous riparian systems are critical habitat for bird species, particularly small deciduous islands in the Bitterroot National Forest. These islands may provide the only habitat relatively free from cowbird parasitism. A primary land management goal should be the protection and enhancement of deciduous communities on National Forest lands. Priority should be placed on promoting and maintaining larger stands further form the agricultural front, and vegetative diversity should be an important goal. Forest planning should focus on reducing the impact of cowbirds by attempting to put the greatest distance between prime bird habitat and prime cowbird feeding areas. Reducing waste grain around riparian systems may help reduce brood parasitism by cowbirds, but a reduction large enough to decrease the number of cowbirds may be infeasible.

Figure 9: Riparian system, Bitterroot Valley.

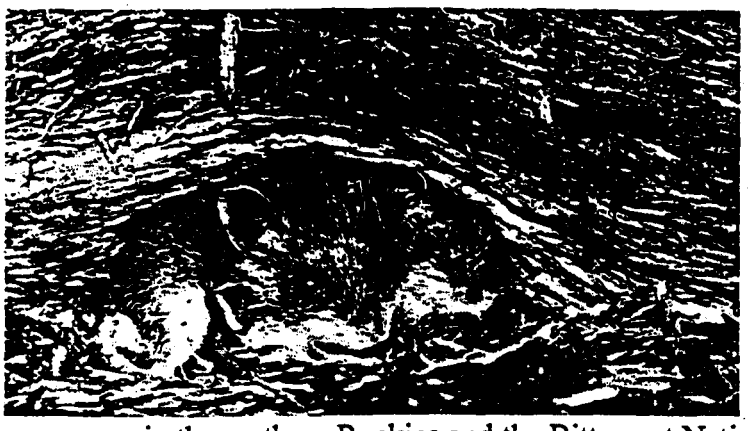
Cottonwood gallery forests are the most productive bird habitats in the western U.S., and their protection requires concerted action by private landowners, local governments, and zoning boards. The largest threat is conversion due to clearing. Direct benefits may also be gained by reducing or removing cattle from these areas, especially in spring. Protection of riparian habitats may be achieved by providing livestock forage outside of riparian areas during spring and early summer, or by fencing off critical habitat to allow only restricted access by cattle. Fire suppression may be causing habitat conversion in existing cottonwood patches and preventing the initiation of new patches.

Small mammals of the Bitterroot National Forest: habitat associations, ecological interactions, and implications for forest management

by Dean Pearson

Reestablishing historic ecosystem functions will result in landscape level changes in vegetation that will strongly affect existing small mammal communities. This literature review evaluated the effects of timber harvest and fire on small mammal communities. Small mammals play a significant ecological role in forest ecosystems. They influence these ecosystems by: selective foraging, burrowing and digging, seed and insect predation, fungus consumption and spore dispersal, and providing a prey base for predators.

Figure 9: Deer mice in a huddle.



Stand replacing fires, clearcutting, and other timber harvests restructure small mammal communities, often with detrimental effects. Coarse woody debris (CWD) has high potential to affect oscillations in small mammal populations and therefore their predators. CWD lies at the center of ecosystem processes in the northern Rockies and the Bitterroot National Forest. The way CWD is managed in various habitats affects the diversity and health of small mammal communities, and possibly overall ecosystem stability. There is no indication that CWD is being managed as an important component of forest ecosystems, and the historic role of CWD in the BNF under pre-settlement fire conditions has not been considered. Timber harvest and controlled fire can contribute to maintaining CWD by reducing fuel loads to more natural levels while maintaining the volume necessary for ecological functions. CWD and snags can be retained indefinitely in managed stands by committing some trees from each cohort to CWD and snag management, and by letting these trees mature, die and eventually fall and decay.

ADDITIONAL INFORMATION

More information on the following studies and other related research can be found at the BEMRP website:
www.fs.fed.us/rm/ecopartner/

Reducing forest fire hazard in residential and scenic areas: a case study comparing three treatments in a western Montana ponderosa pine stand

Conservation implications of a multi-scale study of flammulated owl habitat use in the northern Rocky Mountains, USA

Riparian forests and avian productivity

Small mammals of the Bitterroot National Forest: habitat associations, ecological interactions, and implications for forest management

Information on any BEMRP research can be found by contacting:

Greg Jones, Program Leader
Bitterroot Ecosystem Management Research Project
Rocky Mountain Research Station
Box 8089, 800 E. Beckwith
Missoula, MT 59807

APPENDIX B

Questionnaire

Opportunities for "On the Ground" Action in the Bitterroot Valley

Sponsored by: The Bitterroot Ecosystem Management Research Project (BEMRP)

Administered by: The Bolle Center for People and Forests
Jim Burchfield and Michelle Byington
School of Forestry
University of Montana
Missoula, MT 59812

Instructions to respondent

The following questionnaire is part of an effort by the Bitterroot Ecosystem Management Research Project (BEMRP) to understand the potential for people to identify appropriate natural resource management actions in the Bitterroot Valley. Responding to this questionnaire is entirely voluntary, and the identity of each respondent will remain confidential. Information collected on this questionnaire will be used to support future communications among scientists, natural resource managers, and citizens on the priorities for land management activities in the Bitterroot Valley.

Please note that the questions regarding opportunities for action are concerned with "on the ground" priorities. The administrators of this study recognize that many people are concerned with questions about decision-making processes and public participation. Other studies within the BEMRP project have been designed to address these questions. This particular study is focused on those opportunities that have potential for a physical, or tangible, result on public and private lands within the Bitterroot Valley. A constraint, or any "non-action," that you mention will be considered of equal significance to any named "actions." The two major categories of land that are of interest are the Bitterroot National Forest, managed by the USDA Forest Service, and non-urban private lands.

Thank you in advance for your cooperation with this study on opportunities for "on the ground" actions.

Priorities for addressing natural resource conditions in the Bitterroot Valley

1) What is the most important thing that should happen on the ground on the Bitterroot National Forest?

2) What other important things should happen on the ground on the Bitterroot National Forest?

3) Are there specific places that the above mentioned actions (or constraint of actions) should occur?

4) What is the most important thing that should happen on rural, private lands in the Bitterroot Valley?

5) What other important things should happen on rural, private lands in the Bitterroot Valley?

6) Are there specific places that the above-mentioned actions (or constraint of actions) on private lands should occur?

7) Outside of wilderness areas, in what specific places should nature be allowed to take its course?

8) Several studies within BEMRP have been conducted to evaluate conditions affecting different wildlife species in the Bitterroot Valley. Which wildlife species are of primary concern to you?

9) Habitat monitoring has also been emphasized in recent research, addressing the distribution, abundance, and quality of the habitats for various wildlife species. What wildlife habitat would you consider most important?

10) A large component of BEMRP has been vegetation studies. They have described current conditions and processes in the forest and grassland communities in the Bitterroot Valley. What issues relating to forest and grassland vegetation would you consider of primary concern?

11) In what ways could scientific research be effective in clarifying opportunities for action relative to natural resources management in the Bitterroot Valley?

12) How might the information generated by BEMRP be effectively distributed?

13) Please indicate the extent to which you agree or disagree with the following statements. Use the following scale: 1=strongly disagree...3=neutral...5=strongly agree

Disagree ... Agree	
1 2 3 4 5	The primary use of forests should be for products that are useful to humans
1 2 3 4 5	Forests should be primarily for timber and wood products
1 2 3 4 5	We should actively harvest more trees to meet the needs of a much larger human population
1 2 3 4 5	Plants and animals exist primarily for human use
1 2 3 4 5	Humans should have more love, respect, and admiration for forests
1 2 3 4 5	forests have a right to exist for their own sake, regardless of human concerns and uses
1 2 3 4 5	Wildlife, plants, and humans have equal rights to live and develop
1 2 3 4 5	In managing forests, more attention should be given to preserving nature for its own sake rather than producing goods
1 2 3 4 5	Management of forests is not needed

A few questions about you

14) What is your age? _____

15) Are you a Bitterroot Valley resident? _____

If yes, for how long? _____

16) Please place a check next to the item(s) below that best describes where you live.

___ In an owner-occupied house in a town
___ In a rental, house or apartment in a town
___ In a residence on a large (> 20 acres) parcel of land outside of town
___ In a residence on a small (< 20 acres) parcel of land outside of town
___ Within one mile of National Forest land
___ Other (please describe)

17) What is your occupation?

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!

Follow-up Questionnaire

Opportunities for "On the Ground" Action in the Bitterroot Valley

Sponsored by: The Bitterroot Ecosystem Management Research Project (BEMRP)

Administered by: The Bolle Center for People and Forests
Jim Burchfield and Michelle Byington
School of Forestry
University of Montana
Missoula, MT 59812

Instructions to respondent

Thank you for participating in this research sponsored by the Bitterroot Ecosystem Management Research Project (BEMRP). This is the second and last time that you will have to fill our a questionnaire on your priorities for natural resource management actions in the Bitterroot Valley. Just like the first questionnaire, responding to this questionnaire is entirely voluntary, and the identity of each respondent will remain confidential.

Again, the questions regarding opportunities for action are concerned with "on the ground" priorities. After we summarize these responses and the content of the dialogue that occurred in you meeting with scientists, we will make sure that you receive a copy of our analysis and final report on this subject.

Thank you in advance for your cooperation with this study on opportunities for "on the ground" actions.

Priorities for addressing natural resource conditions in the Bitterroot Valley

1) What is the most important thing that should happen on the ground on the Bitterroot National Forest?

2) What other important things should happen on the ground on the Bitterroot National Forest?

3) Are there specific places that the above mentioned actions (or constraint of actions) should occur?

4) What is the most important thing that should happen on rural, private lands in the Bitterroot Valley?

5) What other important things should happen on rural, private lands in the Bitterroot Valley?

6) Are there specific places that the above-mentioned actions (or constraint of actions) on private lands should occur?

7) Outside of wilderness areas, in what specific places should nature be allowed to take its course?

8) Several studies within BEMRP have been conducted to evaluate conditions affecting different wildlife species in the Bitterroot Valley. Which wildlife species are of primary concern to you?

9) Habitat monitoring has also been emphasized in recent research, addressing the distribution, abundance, and quality of the habitats for various wildlife species. What wildlife habitat would you consider most important?

10) A large component of BEMRP has been vegetation studies. They have described current conditions and processes in the forest and grassland communities in the Bitterroot Valley. What issues relating to forest and grassland vegetation would you consider of primary concern?

Project evaluation:

11) Would you consider the summary of BEMRP study results distributed as part of this project effective in communicating scientific information? Please explain.

12) Was the dialogue among group participants and researchers effective in clarifying priorities for action in the Bitterroot? In other words, was this process useful in identifying opportunities, constraints, and tradeoffs in developing land management actions in the Bitterroot? Please explain.

13) Please include any additional comments regarding this study.